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On the taxonomic status of *Laburrus confusus* Vilbaste, 1980 (Homoptera: Cicadellidae: Deltocephalinae)

О таксономическом статусе *Laburrus confusus* Vilbaste, 1980 (Homoptera: Cicadellidae: Deltocephalinae)

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ABSTRACT. Investigation of vibratory calling signals of *Laburrus confusus* Vilbaste, 1980 demonstrated that this form is a good species. Comparative data on morphology, acoustic signals, host plants and distribution of *L. confusus* and two other species from the *L. impictifrons* group from Russia are provided.

РЕЗЮМЕ. Исследование вибрационных призывных сигналов *Laburrus confusus* Vilbaste, 1980 подтвердило видовой статус этой формы. Приведены сравнительные данные по морфологии, акустическим сигналам, кормовым растениям и распространению *L. confusus* и двух других видов группы *L. impictifrons* с территории России.

For a long time *Laburrus impictifrons* (Boheman, 1852) was considered to be widespread species occurring throughout the Palaearctic from Western Europe to the Russian Far East and Japan. In the course of investigations of leafhoppers of eastern regions of Russia Vilbaste [1965, 1966, 1980] described three species closely related to *L. impictifrons* and stated his belief that *L. impictifrons* sensu lato is not a single species, but a complex of forms certain of which still remain undescribed [Vilbaste, 1980]. Other authors did not accept this point of view, however. In all other works on Cicadinea of eastern parts of Russia only the name *L. impictifrons* was used.

Recent investigation of vibratory calling signals of males in this genus partially substantiated the opinion expressed by Vilbaste [Tishechkin, 2002]. *L. similis* Vilbaste, 1965, which was described from Altai Mountains, actually appeared to be a good species replacing *L. impictifrons* in Siberia and the Russian Far East. On the other hand, *L. melanurus* Vilbaste, 1966 from the Southern Maritime Province was demonstrated to be a synonym of the former species.

L. confusus Vilbaste, 1980 was described from the Southern Tyva (Central Siberia) and had never been mentioned in any other works afterwards. Until now it remained one of the dubious forms in this genus. Our investigation of calling signals of representatives of *Laburrus* in steppe regions of Siberia furnished an opportunity to clarify its taxonomic status.

Recordings of vibratory signals were made by means of piezo-electric crystal gramophone cartridge connected to the microphone input of cassette recorder "Elektronika-302–1" or minidisk recorder Sony Walkman MZ-NH900 via the matching amplifier. Analysis of recordings was performed on PC.

Data for recordings of signals of leafhoppers used in the paper are given in the Table. All the material studied including the specimens which signals were recorded is deposited in the collection of the Zoological Museum of M.V. Lomonosov Moscow State University.

Analysis of calling signals showed that on the territory of Russia the '*impictifrons*'-group includes at least three species, namely, *L. impictifrons, L. similis* (= *L. melanurus*) and *L. confusus*.

The main part of calling of *L. impictifrons* consists of about 3–7 syllables (Figs 1–3); usually a train of short discrete pulses presents in the beginning or/and in the end of signal (Fig. 2).

Calling signal of *L. confusus* is a succession of short syllables or pulses (Figs 4–10). It varies considerably both in length (from 3–5 up to 25–30 s in our recordings, Figs 4–6) and in temporal pattern (Figs 7–10). In addition, signal of another kind was registered in individuals from Tyva and Buryatia. It consists of single or repeating syllables including short abrupt click and a succession of sine waves each (Fig. 4, the end of the oscillogram; Figs 11–12). Insects have not demonstrated any specific activity when producing this signal, so its function remains obscure.

Table. Data for recordings of calling signals of the studied species of *Laburrus*.
Таблица. Данные о записях призывных сигналов изученных видов *Laburrus*.

Species	Locality	Air temperature during recording, °C
L. impictifrons	Env. Dosang railway Station about 60 km N of Astrakhan', *Artemisia arenaria* and *A. scoparia* in sand desert. 3 ♂♂	25
L. similis	1. Env. Shcherbakovka Village, northern part of Kamyshin Region, Volgograd Area, *A. vulgaris*. 4 ♂♂	21–22
	2. Ina Riv. 4–5 km west of Ina Village, Barguzin Depression, Buryatia, *Artemisia* sect. *Campestris*. 2 ♂♂	29–31
	3. Klichkinskiy Mtn. Ridge at the crossing with Urulyunguy Riv. (15 km west of Klichka Town), south-eastern part of Chita Area, *A. dracunculus*. 3 ♂♂	21
L. confusus	Selenga Riv. valley 4–5 km north of Novoselenginsk Town, Buryatia, *Artemisia* sp. and *A. frigida*. 4 ♂♂	25–27

In *L. similis* calling signal is much more complex than in two previous species. It consists of prolonged single of repeating phrases lasting from 3–5 up to 30–40 s and more (Figs 13–15). Typically, each phrase begins with a succession of syllables (Figs 16–18) after which a long trill of uniform pulses follows (Figs 19–24). Fluctuations of amplitude and, occasionally, of pulse repetition period present in the beginning of a trill (Figs 19–21); as a rule, they become less distinct towards the end of signal (Figs 22–23). Temporal pattern of signals in individuals from different populations for the most part is similar, but in males from the Russian Far East additional fragments present in the beginning and in the end of a phrase described above [Tishechkin, 2002].

L. similis is quite abundant throughout all the Southern Siberia from Altai Mountains to Eastern Transbaikalia and in the Russian Far East, but is very rare in European Russia. It was found only on South Urals (environs of Guberlya railway station, 25 km west of Orsk, Orenburg Area) and in an isolated locality in Lower Volga Region (environs of Shcherbakovka village, north of Kamyshin Region, Volgograd Area). Undoubtedly, this species is also widespread in Mongolia and Northern China.

L. impictifrons occurs in Europe, Ukraine and Kazakhstan. On the territory of Russia its range includes European part of the country at least from the latitude of Moscow Area southwards as far as semideserts and deserts of Lower Volga Region on the western boundary of Kazakhstan. Records from Mongolia and the Russian Far East [Vilbaste, 1968; Emelyanov, 1977; Anufriev & Emelyanov, 1988, etc.] should be referred to two other species of the group. Record from Western Siberia in Tishechkin [2002] refers to *L. confusus*.

L. confusus was found only in steppes of Central and Eastern Siberia. I have studied the material from several localities in Central and Southern Tyva, from steppes in the environs of Balagansk (Irkutsk Area) and from the valley of Selenga River (Southern Buryatia). Also, occurrence of this species in adjacent parts of Mongolia is most probable.

All species studied have similar host preferences. They were never found on *Artemisia* from the subgenus *Seriphidium*, but can feed on various species from the subgenera *Artemisia* and *Dracunculus*. *L. impictifrons* dwells mainly on *Artemisia* subg. *Dracunculus*, two other species do not demonstrate any preferences.

Morphological differences between species of '*impictifrons*'-group are rather obscure.

L. similis has comparatively bright green or greenish-yellow coloration, fore wings are opaque, venation is less distinct than in two other species. Wing apices in males normally are blackened at least up to the ends of subapical cells (Fig. 25). Always macropterous, fore wings reach beyond the end of abdomen. Somewhat larger than two other species: length of male up to the ends of fore wings 4.2–5.1 mm, of female — 4.8–6.1 mm.

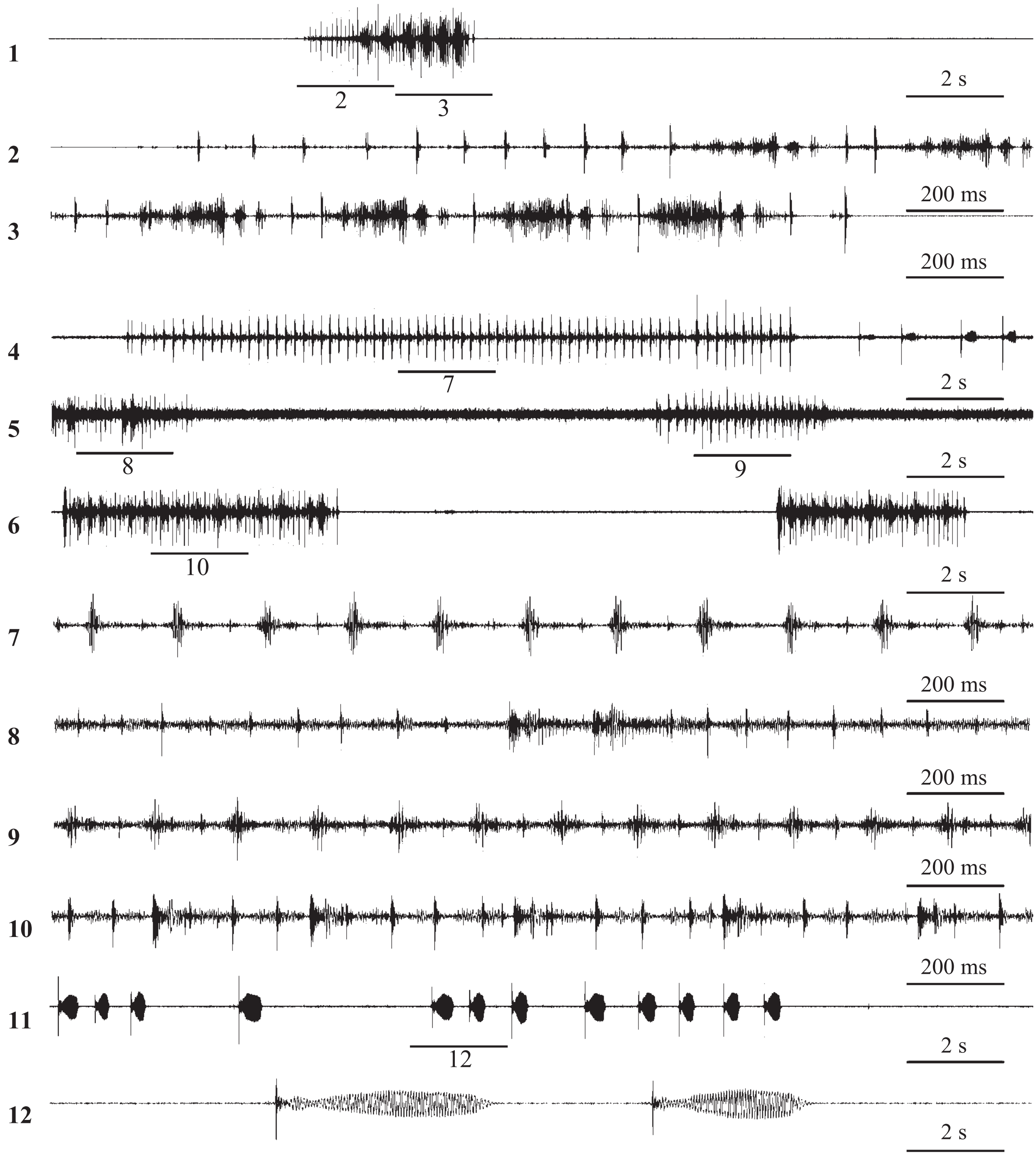
Differs from *L. impictifrons* and *L. confusus* by brighter coloration and widely darkened ends of fore wings, from the former one also, in more sharply bent stem of penis (Figs 31–33). In Vilbaste [1965] and Tishechkin [2002] the small area covered with denticles on the upper side of the ends of pygofer lobes is mentioned as a good diagnostic character of *L. similis*. Investigation of numerous materials from various parts of the range showed that the denticulate field is not always well-developed, however.

In *L. impictifrons* coloration is pale yellowish, green tinge is almost entirely absent. Fore wings are transparent (in certain cases, with the exception of basal part), venation is distinct, the ends are darkened at most up to the middle of apical cells (Fig. 26). Fore wings not infrequently are somewhat shortened and reach the end of abdomen only, especially in females. Length of male up to the ends of fore wings 3.9–4.8 mm, of female — 4.4–5.1 mm.

Differs from *L. similis* in coloration of fore wings, from *L. confusus* — by more smoothly bent stem of penis (investigation of several specimens is advisable, Figs 34–36). Moreover, apparently, *L. similis* and *L. impictifrons* are allopatric.

L. confusus in external appearance is similar with the previous species (Fig. 27), but somewhat smaller: length of male up to the ends of fore wings 3.7–4.2 mm, of female — 4.3–4.8 mm. Stem of penis with comparatively sharp bending (Figs 37–40), but usually is not so angular as on the drawing in the primary description [Vilbaste, 1980]. Other structures of male genitalia do not provide reliable diagnostic characters (Figs 28–30).

Sympatric with *L. similis*, in the valley of Selenga River (Buryatia) these two forms have been collected in the same biotope, but no specimens with intermediate characters were found. Differs from *L. similis* by small-

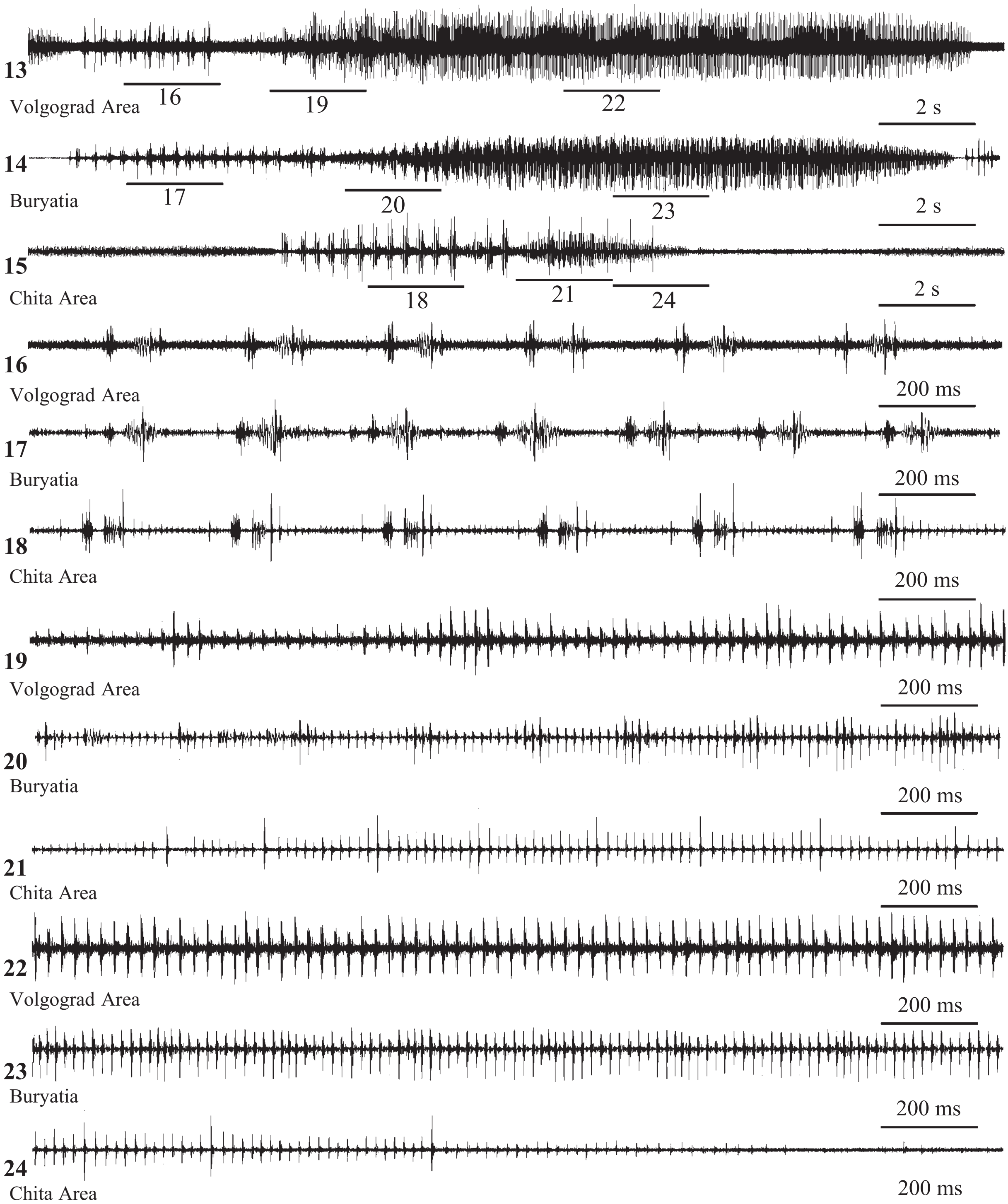


Figs 1–12. Oscillograms of vibratory signals of males of *Laburrus*. 1–3 — *L. impictifrons*, calling signal; 4 — *L. confusus*, calling signal and signals of obscure function; 5–10 — same, calling signals; 11–12 — same, signals of obscure function. Faster oscillograms of the parts of signals indicated as “2–3”, “7–10” and “12” are given under the same numbers.

Рис. 1–12. Осциллограммы вибрационных сигналов самцов *Laburrus*. 1–3 — *L. impictifrons*, призывный сигнал; 4 — *L. confusus*, призывный сигнал и сигналы неясного назначения; 5–10 — то же, призывные сигналы; 11–12 — то же, сигналы неясного назначения. Фрагменты сигналов, помеченные цифрами “2–3”, “7–10” и “12”, представлены при большей скорости развёртки на осциллограммах под соответствующими номерами.

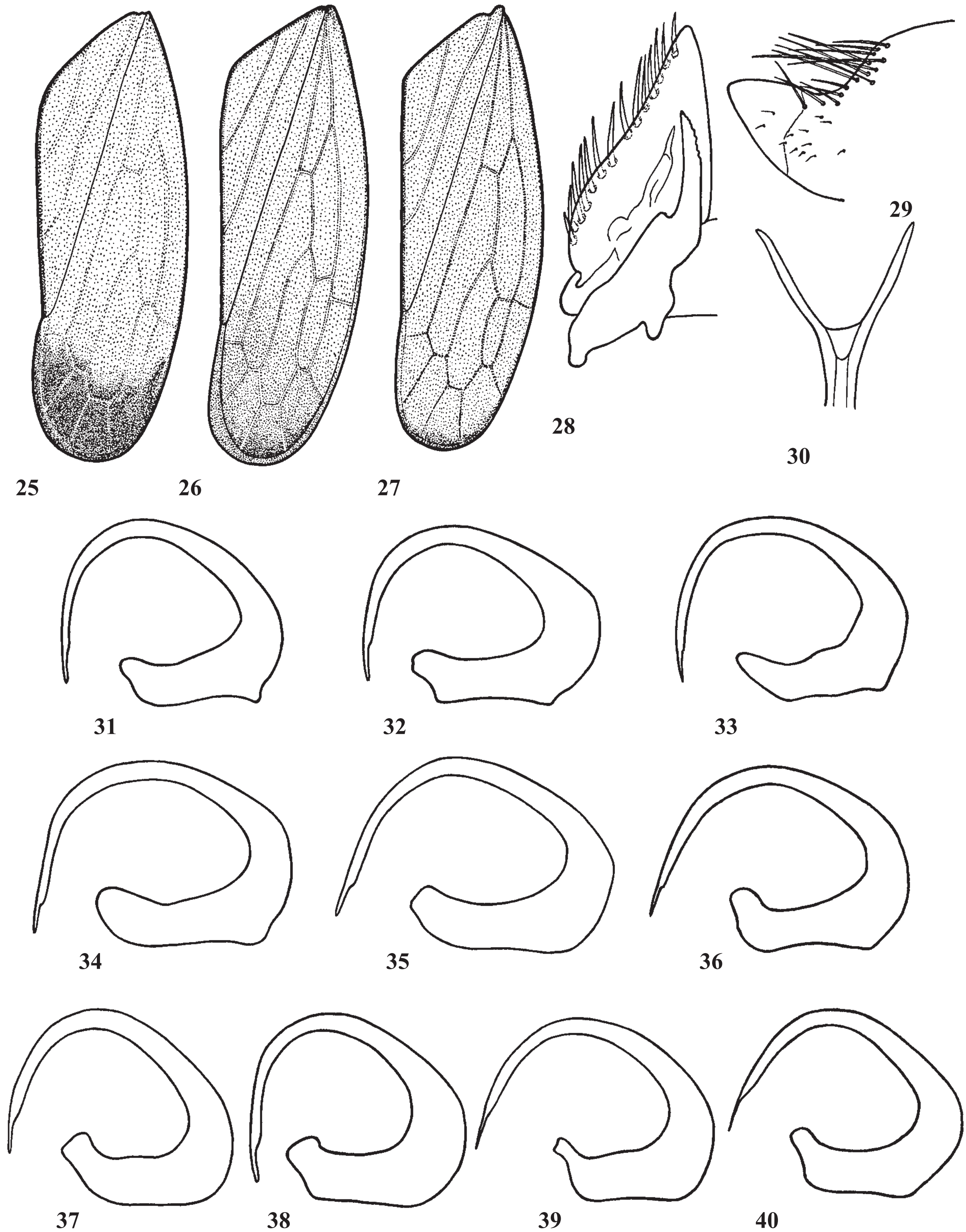
er size and coloration of fore wings. Concerning the differences between *L. confusus* and *L. impictifrons* see the item on the latter species above.

Therefore, analysis of male calling signals indicates conclusively that *L. confusus* is a distinct species occurring in steppes of Central and Eastern Siberia. Apparently, it is allopatric with closely related *L. impictifrons*. The ranges of *L. confusus* and *L. similis* overlap to a great extent, but these two species differ distinctly from each other.



Figs 13–24. Oscillograms of calling signals of *Laburrus similis* from different localities. Faster oscillograms of the parts of signals indicated as “16–24” are given under the same numbers.

Рис. 13–24. Осциллограммы призывных сигналов *Laburrus similis* из разных точек. Фрагменты сигналов, помеченные цифрами “16–24”, представлены при большей скорости развёртки на осциллограммах под соответствующими номерами.



Figs 25–40. 25 — *Laburrus similis*, fore wing; 26 — same, *L. impictifrons*; 27 — same, *L. confusus*; 28 — *L. confusus*, style and genital plate; 29 — same, pygofer lobe; 30 — same, apex of penis; 31–33 — *L. similis*, penis, lateral aspect; 34–36 — same, *L. impictifrons*; 37–40 — same, *L. confusus* (37–38 — specimens from Selenga Valley, Buryatia; 39–40 — specimens from Tyva).

Рис. 25–40. 25 — *Laburrus similis*, переднее крыло; 26 — то же, *L. impictifrons*; 27 — то же, *L. confusus*; 28 — *L. confusus*, стилус и генитальная пластинка; 29 — то же, доля пигофора; 30 — то же, вершина пениса; 31–33 — *L. similis*, пенис сбоку; 34–36 — то же, *L. impictifrons*; 37–40 — то же, *L. confusus* (37–38 — экземпляры из долины Селенги, Бурятия; 39–40 — экземпляры из Тувы).

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